UJIAN TENGAH SEMESTER GANJIL 2010/2011
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS GADJAH MADA YOGYAKARTA

(4)

MATA KULIAH : MATEMATIKA FISIKA I — **PROGRAM STUDI : FISIKA**
HARI/TANGGAL : SENIN, 4 APRIL 2011 — **WAKTU UJIAN : 120 MENIT**
DOSEN : PROF. KAMSUL ABRAHA, PH.D. — **SIFAT UJIAN : CLOSED BOOK**

KERJAKAN SEMUA SOAL BERIKUT !

1. Hitunglah nilai determinan dari :
$$\begin{vmatrix} 1 & a & a^2 & 1/a \\ 1 & b & b^2 & 1/b \\ 1 & c & c^2 & 1/c \\ 1 & d & d^2 & 1/d \end{vmatrix}$$

2. Tunjukkan apakah deret berikut ini konvergen / divergen

a. $\sum_{n=0}^{\infty} \frac{\sqrt{(2n)!}}{n!}$ b. $\sum_{n=0}^{\infty} \frac{(-1)^n \sqrt{10n}}{n+2}$

3. a. Hitunglah : $\frac{(i-\sqrt{3})^3}{1-i}$

b. Tuliskan $\sin(\pi - i\ln 3)$ dalam bentuk $x + iy$.

4. Jika arus I_1, I_2, I_3 dan I_4 dalam rangkaian listrik memenuhi persamaan linear

$$3I_1 + 2I_3 - I_4 = 60$$
$$2I_1 - I_2 + 4I_3 = 160$$
$$4I_2 + I_3 - 2I_4 = 20$$
$$5I_1 - I_2 - 2I_3 + I_4 = 0$$

Tentukan I_3 dengan menggunakan aturan Cramer !

1. $f(x) = \sum_{n=0}^{\infty} \frac{f^n(b)}{n!}(x-b)^n$; $f(x+x_0) = \sum_{n=0}^{\infty} \frac{f^n(x)}{n!}(x_0)^n$

2. $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$; $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$; $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$

$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$; $(1+x)^p = 1 + px + \frac{p(p-1)}{2!}x^2 + \frac{p(p-1)(p-2)}{3!}x^3 + \dots$

3. $x + iy = r(\cos\theta + i\sin\theta) = re^{i\theta}$

4. $e^z = e^{x+iy} = e^x e^{iy} = e^x(\cos y + i\sin y)$

5. $\cos\theta = \frac{1}{2}(e^{i\theta} + e^{-i\theta})$; $\sin\theta = \frac{1}{2i}(e^{i\theta} - e^{-i\theta})$; $\cosh\theta = \frac{1}{2}(e^z + e^{-z})$; $\sinh\theta = \frac{1}{2}(e^z - e^{-z})$

6. $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$; $z^{1/n} = r^{1/n}e^{i\theta/n} = \sqrt[n]{r}\left(\cos\frac{\theta}{n} + i\sin\frac{\theta}{n}\right)$

7. $\ln z = \ln r + \ln e^{i\theta} = \ln r + i\theta$; $a^b = e^{b\ln a}$

(i) $\sum_{n=1}^{\infty} a_n$ konvergen $\int_1^{\infty} a_n dn$ finit

(ii) $\sum_{n=1}^{\infty} a_n$ divergen $\int_1^{\infty} a_n dn$ infinit

$\rho_n = \left|\frac{a_{n+1}}{a_n}\right|$; $\rho = \lim_{n\to\infty} \rho_n$

$\sum_{n=1}^{\infty}(-1)^n a_n$ atau $\sum_{n=1}^{\infty}(-1)^{n+1} a_n$

(i) $a_n \geq a_{n+1}$ (ii) $\lim_{n\to\infty} a_n = 0$